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## THE AMERICAN MATHEMATICAL MONTHLY.

Entered at the Post-office at Springfield, Missouri, as second-class matter.

VOL. XVI.

JANUARY, 1909.

NO. 1.

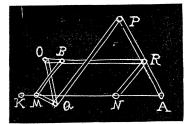
## A NEW LINKAGE FOR DESCRIBING A STRAIGHT LINE BY CONTINUOUS MOTION.

By JOHN J. QUINN, Ph. D., Pittsburg College, Pittsburg, Pa.

In the linkage given herewith the following conditions obtain: M and N are fixed points to which the whole system is pivoted.

$$MQ=OB=\frac{1}{2}OQ;$$
  
 $OQ=MB=PR=RA=NR=\frac{1}{2}QR;$   
 $PQ=OR; BR=MN.$ 

It is required to find the locus of P and A for every movement of the system



if all movable points except P and A describe circles.

1. From the stated conditions, MB is parallel to NR. Hence  $\angle OBM = \angle BRN = \angle RNA$ . Also  $\triangle MOB$  is similar to  $\triangle OPR$ , since the respective sides are proportional.

Then  $\angle OBM = \angle ORP$ , being homologous angles of similar triangles. Hence

 $\angle PRN=2\angle RNA$ . Hence it follows that the locus of P is a straight line perpendicular to MN.

- 2. Since P moves in a straight line, and R is the mid-point of PA, it follows that the locus of A is a straight line. The following corollaries follow immediately:
  - 1. The locus of any point on PA, except R, the mid-point, is an ellipse.
- 2. On a straight line through MN lay off MK=MQ, then K is a fixed point equidistant from the point O.
- 3. If the link OQ be unfastened at Q, and the point Q fixed at K, the loci of P and A remain unchanged.